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**Name of Organization:** New York State Canal Corporation

**Type of Organization:** State

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**Project Title:** Contaminated Sediment Erie Canal - Lockport, NY

**Project Category:** Contaminated Sediments

**Rank by Organization (if applicable):** 0

**Total Funding Requested (\$):** 35,537 **Project Duration:** 0.5 Years

**Abstract:**

Dioxins (PCDD/Fs) and related compounds are highly toxic environmental contaminants identified in the Lake Ontario LaMP and RAPs as being responsible for fish consumption advisories and wildlife toxicity. A recently completed study of sediment quality in the Erie Canal identified two locations containing elevated levels of PCDD/Fs. Fish collected in the area of these "hotspots" were analyzed by the NYSDEC and were also found to contain elevated levels of dioxins. A conclusion of the study was that a fuller characterization of the extent of sediment contamination at these two locations was needed in order to design effective remedial actions. A major limitation is imposed on all efforts to characterize the extent and level of dioxin contamination within ecosystems by the high cost of chemical analysis for these chemicals. The New York State Canal Corporation proposes to apply new technology developed at the Corps of Engineers Waterways Experiment Station to surmount this problem. The P450RGS cell-based assay coupled with accelerated solvent extraction (ASE) has been shown to produce results that correlate very highly with chemical analysis for dioxins and related compounds, is nearly as sensitive as chemical analysis, and can be performed at a fraction of the cost. In this study a sampling and analysis design will be used that optimizes the areal extent and depth of coverage of the two dioxin "hotspots" by using the cell-based assay in a ratio of 5:1 with conventional chemical analysis.

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**Geographic Areas Affected by the Project**

**States:**

<input type="checkbox"/> Illinois	<input checked="" type="checkbox"/>	New York
<input type="checkbox"/> Indiana	<input type="checkbox"/>	Pennsylvania
<input type="checkbox"/> Michigan	<input type="checkbox"/>	Wisconsin
<input type="checkbox"/> Minnesota	<input type="checkbox"/>	Ohio

**Lakes:**

<input type="checkbox"/> Superior	<input checked="" type="checkbox"/>	Erie
<input type="checkbox"/> Huron	<input type="checkbox"/>	Ontario
<input type="checkbox"/> Michigan	<input type="checkbox"/>	All Lakes

**Geographic Initiatives:**

<input type="checkbox"/> Greater Chicago	<input type="checkbox"/> NE Ohio	<input type="checkbox"/> NW Indiana	<input type="checkbox"/> SE Michigan	<input type="checkbox"/> Lake St. Clair
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**Primary Affected Area of Concern:** Eighteenmile Creek, NY

**Other Affected Areas of Concern:**

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***For Habitat Projects Only:***

**Primary Affected Biodiversity Investment Area:**

**Other Affected Biodiversity Investment Areas:**

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**Problem Statement:**

The New York State Canal Corporation has recently completed a study of sediment quality in the Erie Canal between the Niagara River and the Genesee River in New York State (GL985364-01-0). This study identified two locations with elevated levels of dioxin/furans (PCDD/Fs). PCBs and mercury were also found to be present. Both of the locations are within the drainage area of Eighteenmile Creek and Olcott Harbor where the NYS Department of Environmental Conservation has finished a study titled "An Investigation of the Dioxin/Furan Concentrations in the Sediments of the Eighteenmile Creek and the Erie Canal Near Lockport, New York" and "Eighteenmile Creek/Olcott Harbor Sediment Study."

The recent Canal Corporation study provided a general characterization of the Canal sediments over a length of nearly 70 miles. Additional more detailed evaluation of the two locations with elevated contaminants was recommended.

This proposal will provide:

1. for the further field demonstration of a cell-based assay technique for the collection of sediment quality data;
2. for a better assessment of the physical and chemical qualities of the sediment at the two locations to allow for better mapping of the site(s);
3. supplemental sediment quality data can be used to support the development of a risk/hazard assessment for the sediments; and,
4. refinement of the boundaries of the contamination will be useful in assessing remedial alternatives to deal with the sediment contamination.

The U.S./Canadian Lake Ontario Lakewide Management Plan (LaMP) and related Remedial Action Plans (RAP's) provide a systematic process to evaluate and address significant Lake Ontario contaminant issues. The requirements for these programs are defined in Annex 2 of the binational Great Lakes Water Quality Agreement (GLWQA). The Lake Ontario LaMP and RAPs have identified dioxin/furans as contaminants related to consumption advisories and wildlife health problems. The contaminated sediments found in the Erie Canal in the Lockport area may constitute a significant source of dioxin within the United States portion of the Lake Ontario Basin.

**Proposed Work Outcome:**

Twenty-five stations for sediment cores will be assigned at one of the high dioxin locations and thirty-five stations will be assigned at the second location using simple random sampling on grids. Conventional chemical analysis will be used to obtain concentration data on PCDD/Fs, PCBs, mercury, and total organic carbon on ten of the samples. The remaining 50

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samples will be assayed using the cell-based biomarker assay, P450RGS. The samples will be prepared by accelerated solvent extraction and will comply with EPA Method 3545. The assays will comply with EPA Method 4425. The P450RGS biomarker produces a signal that is quantitative and is linear over a concentration range with the amount of dioxin-like activity present in the extract. Dioxin-like activity results from the summation of the concentrations of all chemicals present that bind with the Ah receptor (AhR) multiplied by their relative affinities (binding strength) for the AhR. The most potent of these chemicals is 2,3,7,8-TCDD. All others bind with lesser strength and exhibit a wide range of potencies; e.g., 2,3,4,7,8-pentaCDD is about one-half as potent, and OCDD and OCDF are about 0.001 as potent. There are 13 coplanar PCBs that are recognized as having dioxin-like activity and they range from about 0.1 (3,3',4,4'-pentachlorobiphenyl, PCB-126) to 0.00001 times the potency of 2,3,7,8-TCDD. The PAHs also bind with the AhR and range from about 0.001 to 0.000001 times the potency of 2,3,7,8-TCDD for binding. PAHs are removed in a clean-up step during sample extraction. This is desirable because, unlike coplanar PCBs, PAHs are easily metabolized and do not contribute to the toxic effect of dioxins in living organisms.

Results of the P450RGS assay will be reported as 2,3,7,8-TCDD toxic equivalents (TEQs) and will be regressed on TEQs calculated for the analytical chemistry. In a previous field demonstration a similar study design was used and resulted in a coefficient of correlation (r-square) greater than 0.9 between the cell-based assay and analytical chemistry results. A similar high correlation is expected for the proposed Lockport area "hot spots." This approach to characterizing dioxin contamination of the area will be achieved at a cost approximately \$35,000 less than would be required using analytical chemistry on all of the samples.

The proposed Erie Canal sediment assessment actions will directly assist the Lake Ontario LaMP and RAP's in achieving their goal to reduce levels of dioxin in the environment. These actions will also assist the United States in meeting the following specific objectives of Annex 14 of the GLWQA:

A Contaminated sediment, Section 2(c)(ii), Technology Programs - The Parties in cooperation with State and Provincial Governments shall design and implement demonstration projects for the management of polluted bottom sediment at selected Areas of Concern identified pursuant to Annex 2.

B Contaminated sediment, Section 3(a & b), Long Term measures - The Parties in cooperation with the State and Provincial Governments shall also ensure that measures are adopted for the management of contaminated sediment respecting:

- (1) the construction and the long term maintenance of disposal facilities: and
- (2) the use of contaminated sediment for the creation of land.

C Contaminated sediment, Section 3(a & b), Long Term Measures, Section 4, Reporting;

The Parties shall report their progress in implementing this Annex to the Commission biennially, commencing with a report no later than December 31, 1988.

The Erie Canal is currently utilized for fishing, recreational boating, irrigation of food crops, as well as an emergency public water supply. Analytical results by the NYSDEC indicate the levels of 2,3,7,8 - TCDD in fish collected within this area are significantly elevated. Identification, removal and isolation of the contaminated sediments combined with the elimination of sources will result in a reduction of risk from this contaminant.

The NYS Canal Corporation, a public authority, will be working in partnership with the US Army Corps of Engineers Waterway Experiment Station, a public agency, to successfully undertake this evaluation. Upon completion of the sampling at these two sites the contaminant boundaries should be clearly defined.

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**Project Milestones:****Dates:**

Site Layout/Preparation

11/2000

Sampling

12/2000

Analytical work completed

02/2001

Report

03/2001

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Project End

04/2001

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☐ Project Addresses Environmental Justice**If So, Description of How:**

Environmental Justice not directly addressed

☐ Project Addresses Education/Outreach**If So, Description of How:**

Education Outreach not addressed

**Project Budget:****Federal Share Requested (\$)****Applicant's Share (\$)****Personnel:**

3,142

1,984

**Fringe:**

1,280

0

**Travel:**

2,395

0

**Equipment:**

0

0

**Supplies:**

580

0

**Contracts:**

28,140

5,000

**Construction:**

0

0

**Other:**

0

0

**Total Direct Costs:**

35,537

6,984

**Indirect Costs:**

0

0

**Total:**

35,537

6,984

**Projected Income:**

0

0

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**Funding by Other Organizations (Names, Amounts, Description of Commitments):**

The Corps of Engineers Dredging Operations Environmental Research Program will commit \$5,000 to support application of the P450RGS cell-based dioxin assay for this project, depending on the level of Congressional funding in FY01.

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**Description of Collaboration/Community Based Support:**

U.S. Army Engineer Research and Development Center, Waterways Experiment Station , Vicksburg, MS